



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECE 2510: HARBOUR ENGINEERING
END OF SEMESTER EXAMINATION
SERIES: SEPT. 2017
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Attempt **QUESTION ONE** and **ANY OTHER TWO** questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

- a) i) Outline the procedure of design of breakwaters
ii) State the Sainfluo's simplified formula for the design of breakwaters and illustrate the pressures in it using a suitable graph **(10 Marks)**
- b) Define the following terms used in harbour design: -
 - i. Displacement tonnage
 - ii. Dead weight tonnage **(5 Marks)**
- c) Illustrate the following ship characteristics using suitable sketches
 - i. Important ship descriptions
 - ii. Principle ship movements at a harbour **(5 Marks)**
- d) Define the main wave heights recorded at harbours for design purposes **(5 Marks)**
- e) i) State the factors that determine the choice of dredgers
ii) Sketch a self-propelled bucket dredger **(5 Marks)**

ANSWER ANY TWO QUESTIONS

QUESTION TWO

- a) Explain the factors that determine the choice between open and solid construction of harbour berthing structures **(4 Marks)**
- b) Explain the difference between a wharf and a pier **(3 Marks)**
- c) Use well annotated sketches to describe the following mooring structures: -
 - i. Jetty
 - ii. Block-wall quay



iii. Rock- filled concrete caisson wharf **(13 Marks)**

QUESTION THREE

- i) State any six factors that determine the depth of water in the approach channel and harbour
 - ii) Using a diagram describe the components of depth at a harbour that should be allowed when dredging **(8 Marks)**
- a) Sketch and label the following types of breakwaters: -
- i. Rubble sloping breakwater
 - ii. Concrete block upright breakwater
 - iii. Caisson type upright breakwater **(12 Marks)**

QUESTION FOUR

- a) State any six factors that must be considered when deciding the location of a harbour **(3 Marks)**
- b) Briefly describe the three main types of harbour giving one example of each **(4 1/2 Marks)**
- c) Sketch and label a typical layout of a small artificial harbour **(6 Marks)**
- d) Describe the zones of deterioration of marine structures using a diagram to illustrate your answer **(6 1/2 Marks)**

QUESTION FIVE

- a) Discuss the importance of sea ports in the national and international communication systems **(12 Marks)**
- b) State the sources of trade winds and their influence on sea transportation **(8 Marks)**